



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO.  |
|---|-------------|----------------------|---------------------|-------------------|
| 10/774,690  | 02/10/2004  | Toshio Tanaka        | DK-US045031         | 8586              |
| 22919   | 7590        | 07/26/2005           | EXAMINER            |                   |
| SHINJYU GLOBAL IP COUNSELORS, LLP<br>1233 20TH STREET, NW, SUITE 700<br>WASHINGTON, DC 20036-2680 |             |                      |                     | AL NAZER, LEITH A |
| ART UNIT  |             | PAPER NUMBER         |                     |                   |
|   |             | 2821                 |                     |                   |

DATE MAILED: 07/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                        |                     |
|------------------------------|------------------------|---------------------|
| <b>Office Action Summary</b> | <b>Application No.</b> | <b>Applicant(s)</b> |
|                              | 10/774,690             | TANAKA ET AL.       |
|                              | <b>Examiner</b>        | <b>Art Unit</b>     |
|                              | Leith A. Al-Nazer      | 2821                |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### **Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1)  Responsive to communication(s) filed on 10 February 2004.

2a)  This action is **FINAL**.                            2b)  This action is non-final.

3)  Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

4)  Claim(s) 1-38 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5)  Claim(s) \_\_\_\_\_ is/are allowed.  
6)  Claim(s) 1-38 is/are rejected.  
7)  Claim(s) \_\_\_\_\_ is/are objected to.  
8)  Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

9)  The specification is objected to by the Examiner.

10)  The drawing(s) filed on 10 February 2004 is/are: a)  accepted or b)  objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)  The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)  All    b)  Some \* c)  None of:

1.  Certified copies of the priority documents have been received.
2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3.  Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1)  Notice of References Cited (PTO-892)  
2)  Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3)  Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 09 April 2004.  
4)  Interview Summary (PTO-413)  
Paper No(s)/Mail Date.       .  
5)  Notice of Informal Patent Application (PTO-152)  
6)  Other:       .

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent Publication No. 08-155249 to Tetsuya et al. in view of U.S. Patent No. 6,455,014 to Hammerstrom et al. or U.S. Patent Application Publication No. 2001/0043890 to Son.

With respect to claims 1, 5, and 8-13, Tetsuya teaches a plasma reactor comprising: a first electrode (13) in the shape of a needle (16); a second electrode (14) in the shape of a plate disposed to oppose and to be substantially perpendicular to the first electrode (figure 1); and power supply means (12) connected to the first and

second electrodes for applying a discharge voltage, wherein the first electrode and the second electrode are disposed in a passage space of a target fluid for treating the target fluid by causing streamer discharge between the first and second electrodes (figure 1), and the first electrode having a pointed portion (16) as an end thereof on the side of the second electrode. Claim 1 requires that the pointed portion have a point angle  $\theta$  not less than 30 degrees and not more than 90 degrees. Although not explicitly stated, Tetsuya suggests such a configuration (paragraph 0020). Furthermore, it would have been obvious to one having ordinary skill in the art to utilize such point angle limitations in the system of Tetsuya. The motivation for doing so would have been to provide a point or needle-like electrode with a specific surface area.

Claim 2 requires that the point angle  $\theta$  of the first electrode be not less than 60 degrees and not more than 90 degrees. Although not explicitly stated, Tetsuya suggests such a configuration (paragraph 0020). Furthermore, it would have been obvious to one having ordinary skill in the art to utilize such point angle limitations in the system of Tetsuya. The motivation for doing so would have been to provide a point or needle-like electrode with a specific surface area.

Claim 3 requires that the point angle  $\theta$  of the first electrode be substantially 60 degrees. Although not explicitly stated, Tetsuya suggests such a configuration (paragraph 0020). Furthermore, it would have been obvious to one having ordinary skill in the art to utilize such point angle limitations in the system of Tetsuya. The motivation for doing so would have been to provide a point or needle-like electrode with a specific surface area.

Claim 4 requires that the point angle  $\theta$  of the first electrode be substantially 80 degrees. Although not explicitly stated, Tetsuya suggests such a configuration (paragraph 0020). Furthermore, it would have been obvious to one having ordinary skill in the art to utilize such point angle limitations in the system of Tetsuya. The motivation for doing so would have been to provide a point or needle-like electrode with a specific surface area.

With respect to claim 6, Tetsuya teaches the first electrode having a needle-shaped effective length  $L$  not less than 4 mm and not more than 30 mm (paragraph 0020).

With respect to claim 7, Tetsuya teaches the pointed portion of the first electrode having a curvature radius  $R$  not less than 0.1 mm and not more than 0.7 mm (paragraph 0020).

With respect to claim 14, Tetsuya teaches the second electrode having an opening (32) through which the target fluid passes (figure 3).

Claims 15 requires a treatment member for treating the target fluid, wherein the treatment member is disposed between or downstream of the first electrode and the second electrode. Such a configuration is well known in the art, as is evidenced by Hammerstrom (column 15, lines 8-15 and 33-53) and Son (paragraph 0004). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize such a treatment member in the system of Tetsuya. The motivation for doing so would have been to enhance reactor performance by reducing the presence of unwanted gases, as is suggested by Hammerstrom and Son.

With respect to claim 16, Hammerstrom teaches the treatment member being disposed between or downstream of the first electrode and the second electrode (column 15, lines 8-15 and 33-53).

With respect to claims 17 and 19-23, Hammerstrom (column 15, lines 8-15 and 33-53) and Son (paragraph 0004) both teach the treatment member having a catalytic substance for accelerating the treatment of the target fluid.

With respect to claim 18, Hammerstrom (column 15, lines 8-15 and 33-53) and Son (paragraph 0004) both teach the catalytic substance including at least one element selected from the group consisting of Pt, Pd, Ni, Ir, Rh, Co, Os, Ru, Fe, Re, Tc, Mn, Au, Ag, Cu, W, Mo, and Cr.

With respect to claims 24 and 25, Hammerstrom teaches the treatment member including an adsorbent for adsorbing a target component included in the target fluid (column 15, lines 33-53).

With respect to claim 26, Tetsuya teaches the first electrode (13) being disposed on an upstream side of a flow of the target fluid, and the second electrode (14) being disposed on a downstream side of the flow of the target fluid (figure 1).

With respect to claim 27, Tetsuya teaches the first electrode and the second electrode being alternately disposed along a flow of the target fluid (figures 1 and 3).

With respect to claim 28, Tetsuya teaches one first electrode being disposed on one side of the second electrode and another first electrode being disposed on the other side of the second electrode (figure 3).

With respect to claim 29, Tetsuya teaches the power supply means (12) being a pulse source for supplying a pulse with gentle rise and fall.

With respect to claim 30, Tetsuya teaches the power supply means (12) being an AC power supply.

With respect to claim 31, Tetsuya teaches the power supply means (12) being a DC power power supply.

With respect to claim 32, Tetsuya teaches the first electrode and the second electrode being plural in number and being disposed along a flow of the target fluid (figure 3).

With respect to claim 33, Tetsuya teaches the first electrode having needle electrodes, and the needle electrodes being dispersedly arranged on a cross-sectional plane of the passage space (figure 1).

With respect to claim 34, Tetsuya teaches purification equipment comprising: a casing (figure 1); and a plasma reactor contained in a passage space of target air in the casing and including a first electrode (13) in the shape of a needle (16), a second electrode (14) in the shape of a plate disposed to oppose and to be substantially perpendicular to the first electrode (figure 1), and power supply means (12) connected to the first and second electrodes for applying a discharge voltage, wherein the first electrode has a pointed portion (16) as an end thereof on the side of the second electrode, and an odor component or a toxic component included in the target air being treated by allowing the target air to pass a discharge field of streamer discharge caused between the first and second electrodes (paragraphs 0004 and 0023-0028). Claim 34

requires that the pointed portion have a point angle  $\theta$  not less than 30 degrees and not more than 90 degrees. Although not explicitly stated, Tetsuya suggests such a configuration (paragraph 0020). Furthermore, it would have been obvious to one having ordinary skill in the art to utilize such point angle limitations in the system of Tetsuya. The motivation for doing so would have been to provide a point or needle-like electrode with a specific surface area.

With respect to claim 35, Tetsuya teaches purification equipment comprising: a casing; and a plasma reactor contained in a passage space of a target gas in the casing and including a first electrode in the shape of a needle, a second electrode in the shape of a plate disposed to oppose and to be substantially perpendicular to the first electrode, and power supply means connected to the first and second electrodes for applying a discharge voltage, wherein the first electrode has a pointed portion as an end thereof on the side of the second electrode, and a nitrogen oxide included in the target gas being treated by allowing the target gas to pass a discharge field of streamer discharge caused between the first and second electrodes (paragraphs 0004 and 0023-0028). Claim 35 requires that the pointed portion have a point angle  $\theta$  not less than 30 degrees and not more than 90 degrees. Although not explicitly stated, Tetsuya suggests such a configuration (paragraph 0020). Furthermore, it would have been obvious to one having ordinary skill in the art to utilize such point angle limitations in the system of Tetsuya. The motivation for doing so would have been to provide a point or needle-like electrode with a specific surface area.

With respect to claim 36, Tetsuya teaches purification equipment comprising: a casing; and a plasma reactor contained in a passage space of a flue gas in the casing and including a first electrode in the shape of a needle, a second electrode in the shape of a plate disposed to oppose and to be substantially perpendicular to the first electrode, and power supply means connected to the first and second electrodes for applying a discharge voltage, wherein the first electrode has a pointed portion as an end thereof on the side of the second electrode, and a nitrogen oxide, unburnt fuel and hydrocarbon included in the flue gas being treated by allowing the flue gas to pass a discharge field of streamer discharge caused between the first and second electrodes (paragraphs 0004 and 0023-0028). Claim 36 requires that the pointed portion have a point angle  $\theta$  not less than 30 degrees and not more than 90 degrees. Although not explicitly stated, Tetsuya suggests such a configuration (paragraph 0020). Furthermore, it would have been obvious to one having ordinary skill in the art to utilize such point angle limitations in the system of Tetsuya. The motivation for doing so would have been to provide a point or needle-like electrode with a specific surface area.

With respect to claim 37, Tetsuya teaches purification equipment comprising: a casing; and a plasma reactor contained in a passage space of a flue gas in the casing and including a first electrode in the shape of a needle, a second electrode in the shape of a plate disposed to oppose and to be substantially perpendicular to the first electrode, and power supply means connected to the first and second electrodes for applying a discharge voltage, wherein the first electrode has a pointed portion as an end thereof on the side of the second electrode, and dioxin included in the flue gas is treated by

allowing the flue gas to pass a discharge field of streamer discharge caused between the first and second electrodes (paragraphs 0004 and 0023-0028). Claim 37 requires that the pointed portion have a point angle  $\theta$  not less than 30 degrees and not more than 90 degrees. Although not explicitly stated, Tetsuya suggests such a configuration (paragraph 0020). Furthermore, it would have been obvious to one having ordinary skill in the art to utilize such point angle limitations in the system of Tetsuya. The motivation for doing so would have been to provide a point or needle-like electrode with a specific surface area.

With respect to claim 38, Tetsuya teaches purification equipment comprising: a casing; and a plasma reactor contained in a passage space of a flon gas in the casing and including a first electrode in the shape of a needle, a second electrode in the shape of a plate disposed to oppose and to be substantially perpendicular to the first electrode, and power supply means connected to the first and second electrodes for applying a discharge voltage, wherein the first electrode has a pointed portion as an end thereof on the side of the second electrode, and the flon gas is treated by allowing the flon gas to pass a discharge field of streamer discharge caused between the first and second electrodes (paragraphs 0004 and 0023-0028). Claim 38 requires that the pointed portion have a point angle  $\theta$  not less than 30 degrees and not more than 90 degrees. Although not explicitly stated, Tetsuya suggests such a configuration (paragraph 0020). Furthermore, it would have been obvious to one having ordinary skill in the art to utilize such point angle limitations in the system of Tetsuya. The motivation for doing so would have been to provide a point or needle-like electrode with a specific surface area.

***Citation of Pertinent References***

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patent documents further show the state of the art with respect to plasma reactors and purification equipment comprising plasma reactors:

- a. U.S. Patent No. 4,954,320 to Birmingham et al.
- b. U.S. Patent No. 5,801,489 to Chism, Jr. et al.
- c. U.S. Patent No. 6,811,757 to Niv et al.
- d. U.S. Patent No. 6,818,193 to Christodoulatos et al.
- e. U.S. Patent Application Publication No. 2004/0050684 to Babko-Malyi et al.
- f. Japanese Patent Publication No. 09-000869 to Koichi et al.

***Communication Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leith A. Al-Nazer whose telephone number is 571-272-1938. The examiner can normally be reached on Monday-Friday, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Don Wong can be reached on 571-272-1834. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LA



HOANG V. NGUYEN  
PRIMARY EXAMINER